

**Project Summary**

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**Carbon Monoxide Commuter  
Exposure Data Base: A 5-Day  
Study in Los Angeles**

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Recent concern about carbon monoxide exposure to the commuter population prompted the U.S. Environmental Protection Agency to conduct a five-day field project to assess the carbon monoxide (CO) exposure to Los Angeles commuters. The purpose of this report is to document the field project and to provide the data collected during the project to the public. The data collected include measurements of interior CO, exterior CO and vehicle speed for three vehicles traveling typical commuter routes during the morning and evening peak traffic periods. In addition, hourly average CO measurements were taken from eight South Coastal Air Quality Management District fixed-site monitoring stations and six California Transportation Agency vans in the proximity of the commuter routes.

*This Project Summary was developed by EPA's Environmental Sciences Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).*

**Introduction**

During October 1 through 5, 1979, Science Applications Incorporated, under contract with the U.S. Environ-

mental Protection Agency, conducted a field study to monitor CO concentrations both inside and outside three vehicles traveling typical commuter routes in Los Angeles County. The vehicles traveled the typical commuter routes during the morning and the evening peak traffic periods. Two Inter-scan continuous CO analyzers were installed in each vehicle to monitor CO levels simultaneously inside and outside the vehicles. The outside sampling probe was located near the fresh air intake, while the inside probe was located near the driver's breathing zone. The instrumentation, route selection, monitoring conditions, and observed data are presented.

The data collected included recorder time traces of interior CO (CO<sub>INT</sub>), exterior CO (CO<sub>EXT</sub>), and vehicle speed. Accompanying these were the technician log sheets describing conditions present as data were taken. Conditions included location, roadway description, degree of traffic congestion, and vehicle comfort state. In addition, hourly average CO measurements were taken from eight South Coastal Air Quality Management District fixed-site monitoring stations and six California Transportation Agency vans in the proximity of the commuter routes chosen.

The full EPA report describes the instrumentation used in the study, the route selection and experimental design, and the development of the data

base. Appendices A and B in the report present the exposure and fixed site data. Appendix C describes the methodology used to estimate the one-minute averages and Appendix D presents a graphical display of the exposure data.

## Procedure

The monitoring periods and routes were chosen to correspond to representative commuter trips throughout the Los Angeles area. Although no specific available "typical" commuter routes have been published, general knowledge of the traffic patterns, along with other factors such as traffic counts, was used to select vehicle routes. Each vehicle essentially simulated two commuter travel patterns. The mileage driven was partitioned so that freeway and arterial driving accounted for roughly 80 to 20 percent, respectively. Furthermore, the routes all traveled some portion of the "42-mile loop." This loop is instrumented by CALTRANS to provide real-time traffic volume and speed data. A final consideration was the proximity of routes to air quality monitoring stations. Since the latter are placed throughout the area, there was no problem in locating routes near fixed site stations.

The three Plymouth Valiants used traveled morning and afternoon commuter routes. The three vehicles followed the prescribed commuter routes as nearly as possible during the five-day study, and traveled over the routes as many times as possible during each three-hour period. Each half-hour during a commuter run, a new comfort state was established in the vehicle, according to a predetermined schedule. In order to provide an adequate descrip-

tion of the measurement conditions a detailed recording of real time information was made. An unambiguous correspondence among CO levels, vehicle speed, and recorder observations was made by assigning an alphabetical code to each notation and simultaneously marking the log and chart papers by check marks in the progressive code letter.

Carbon monoxide was measured using two Interscan 1146 portable continuous analyzers in each vehicle. The Interscan device is a direct reading, battery operated unit with integral sample pumps and battery charger. The detection element is an electrochemical voltametric sensor. The unit is designed for over eight hours of continuous field operation between recharges. The detection ranges are 0 to 50 and 0 to 100 ppm. The electrical output is connected to a Soltec VP-6723S 2-pen portable strip chart recorder. This device has a built-in battery charger and a glitch marker push button feature, which is useful for correlating recorder

trace location with technicians' log comments.

Instrumentation for vehicle speed measurements consisted of a magnetic transducer pickup, pulse analyzer and converter circuitry, and a Soltec recorder. The pickup was attached to the front right disc brake caliper. Its output was a pulse train with rate proportional to the number of ventilator rotor disc slots passing in a unit time. This pulse output was converted to a linear analog direct current voltage which provided the Soltec recorder input.

## Conclusions

The full EPA report does not provide any data analysis or conclusions, but it does provide a description of the experiment and a hard copy of the data collected during the project. These data, along with other data bases, will provide researchers with the necessary tools to characterize commuter exposures to automotive pollutants.

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*The complete report, entitled "Carbon Monoxide Commuter Exposure Data Base: A 5-Day Study in Los Angeles," (Order No. PB 82-103 607; Cost: \$9.50, subject to change) will be available only from:*

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